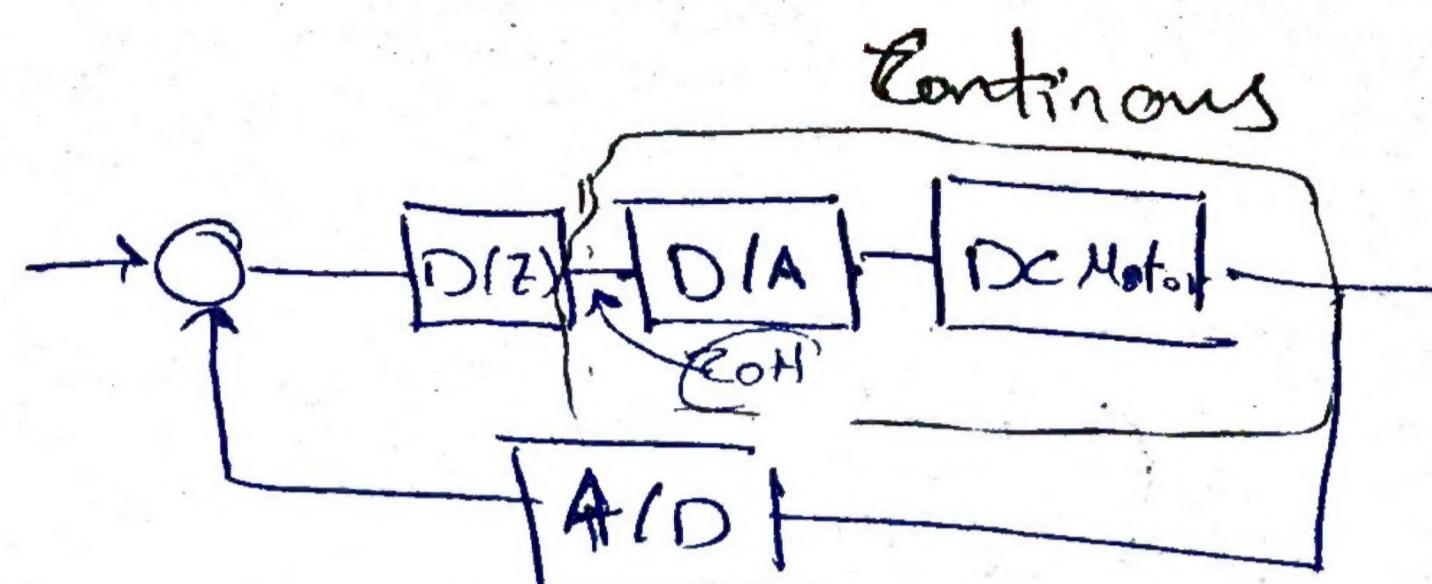


Discrete Equivalent Design Method

Phases of control system design

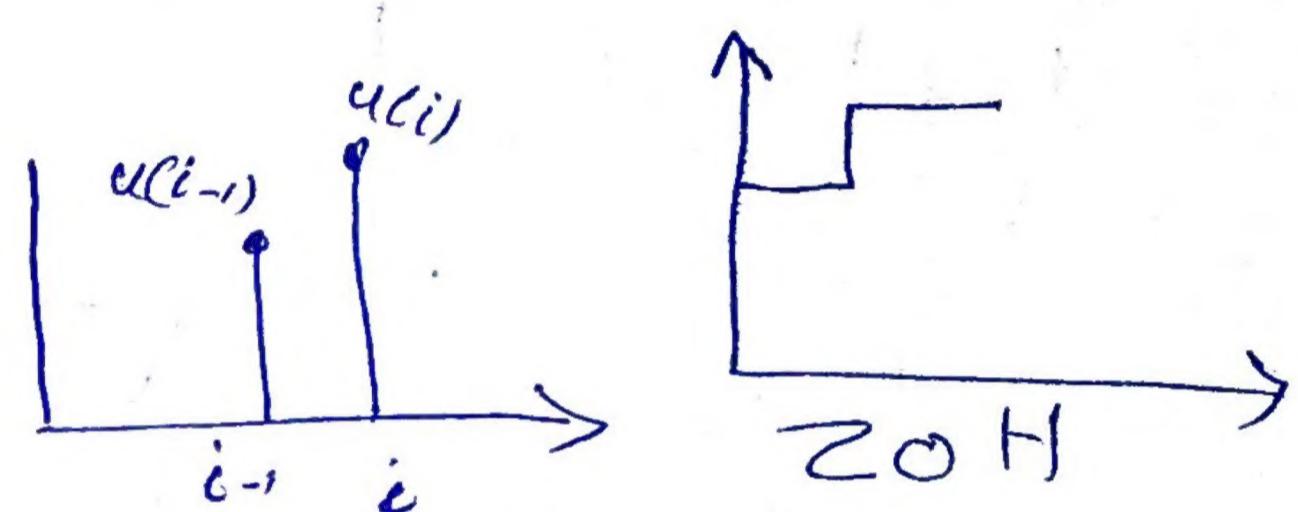
- Modeling
- Analysis
- Design
- Implementation



- Control Action: Value in Register

$$G(s) = \frac{1 - e^{-Ts}}{s}$$

$$G(z) = \underset{ZOH}{z} \left[\underset{G(s)}{\underset{\text{Plan}}{G(s)}} \right]$$



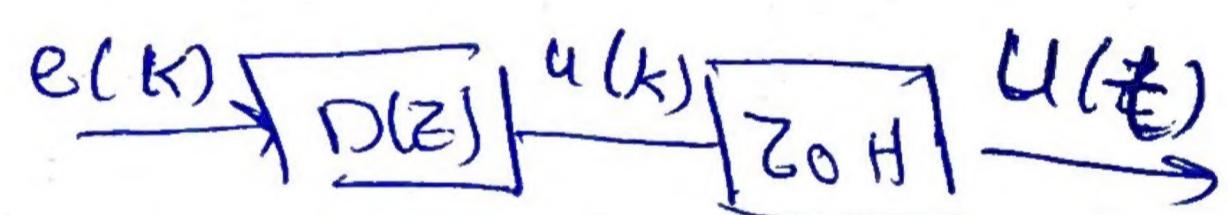
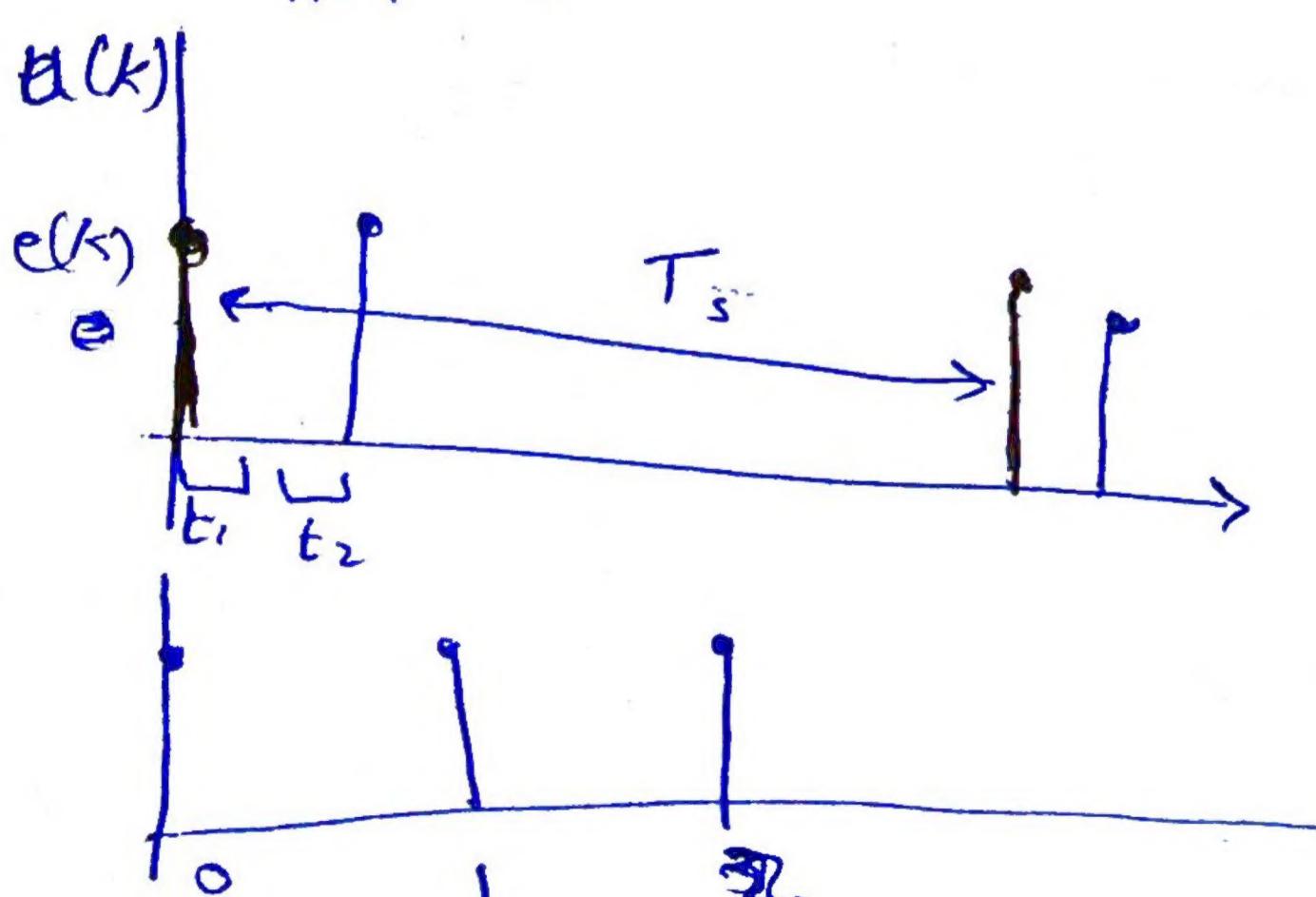
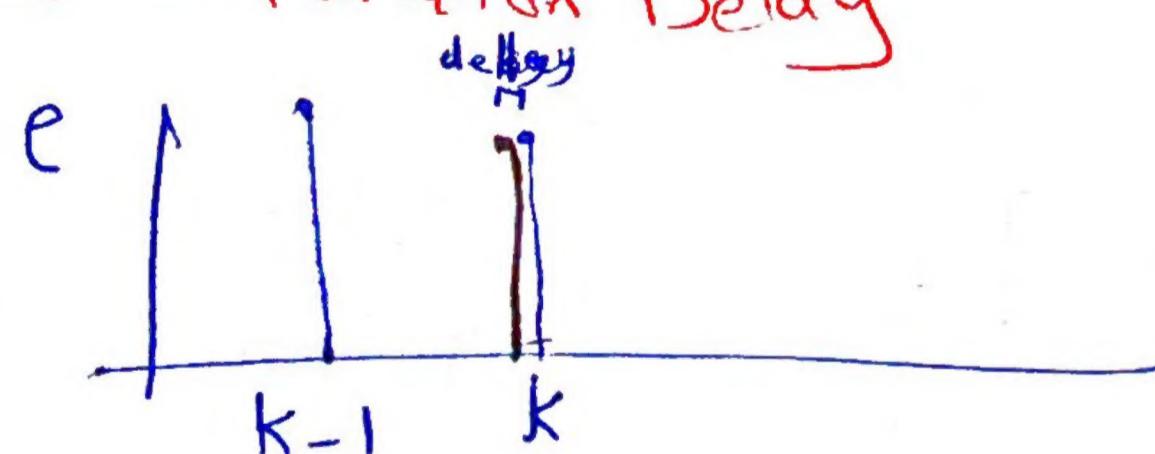
4 - Implementation

For designed compensator

$$D(z) = \frac{az + b}{z + c} = \frac{U(z)}{E(z)}$$

$$u(k) = a \cdot e(k) + b \cdot e(k-1) - c \cdot u(k-1)$$

* Computation Delay



②

$f_s > 10 f_i$

Sampling Frequency

System frequency

Bilinear

$$S = \frac{2}{T} \left(\frac{z-1}{z+1} \right)$$

Controller in Discrete

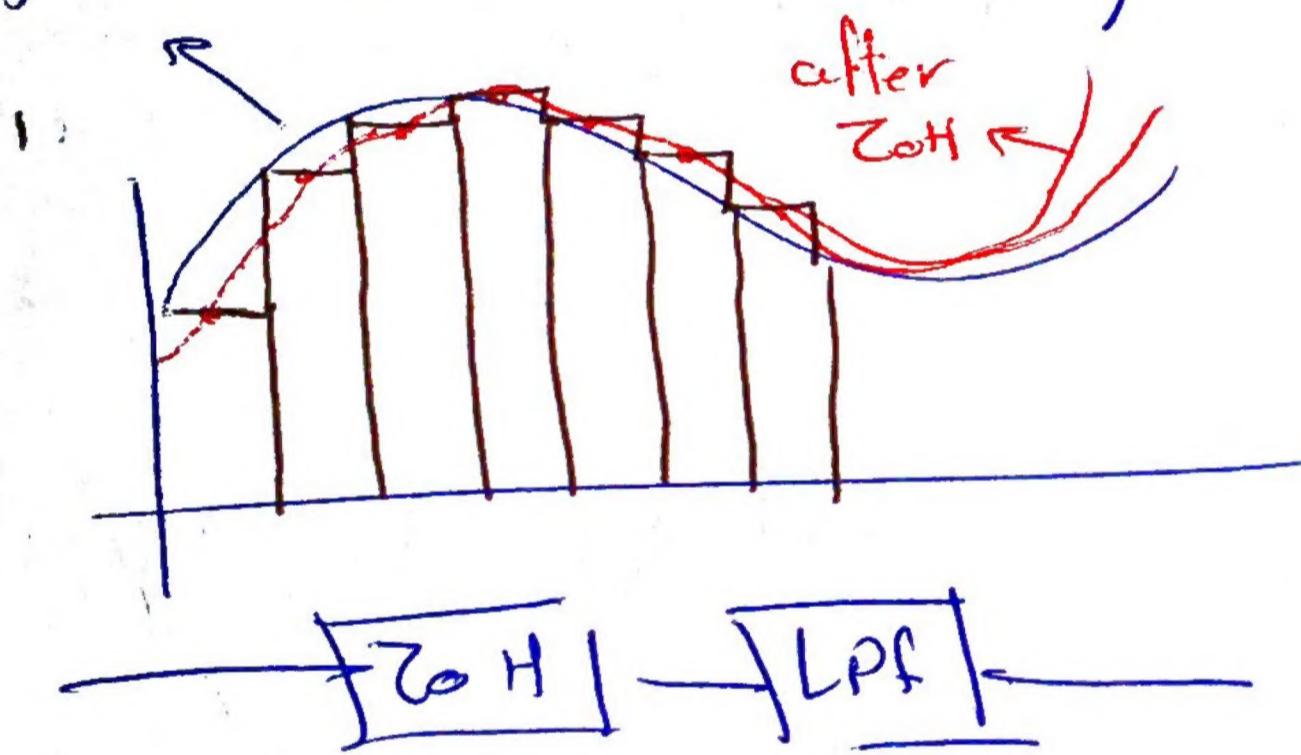
$$D(z) = D(s)$$

Original Curve

$$S = \frac{2}{T} \left(\frac{z-1}{z+1} \right)$$

after

$z \text{OH}$



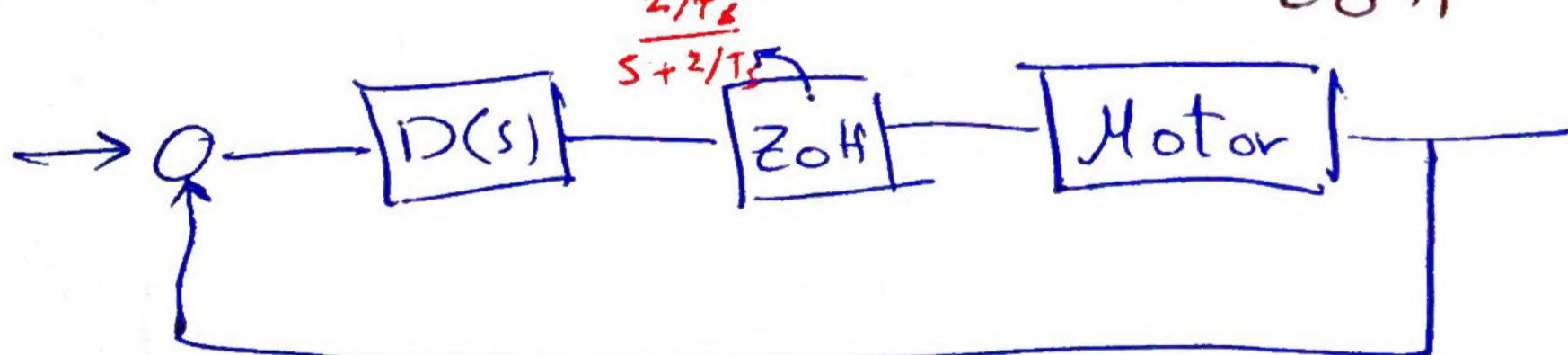
Difference eqn

$$u(k) = a \cdot e(k) + b \cdot e(k-1) + c \cdot u(k-1)$$

(LPF: low pass filter)

So effect of $z \text{OH}$ delay by $\boxed{\frac{T}{s}}$

we have to compute dynamic of $z \text{OH}$



Dynamic of $z \text{OH}$

Approximated

$$G(s) = \frac{2/T}{s + 2/T}$$

Assumption

$f_s > 10 f_i$

$t_c \ll T_s$

Computation time

state is Pure integrator of the system.